Global Assessment of Biomass and Bioproduct Impacts
on Socio-economics and Sustainability

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Report on impacts of biofuels/bioproducts trade and new legislation on economies in Europe

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Contents

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Abbreviations

BAU	Business as Usual
BE	Belgium
DK	Denmark
EU	European Union
EU-27	European Union comprising 27 Member States
Extra- EU	Between EU-member states and non-EU states
FI	Finland
FR	France
GI	Giga Liter
HU	Hungary
IE	Ireland
Intra- EU	Between EU-member states
ISCC	International Sustainability and Carbon Certification
Mt	Megatons
NL	the Netherlands
NTA	Nederlands Technische Afspraak (Dutch Technical Agreement)
PJ	Peta-Joule
RED	Renewable Energy Directive
RES	Renewable Energy Source
RTFO	Renewable Transport Fuel Obligation
RTRS	Roundtable on Responsible Soy
RSPO	Roundtable on Sustainable Palm Oil
SI	Slovenia
UK	United Kingdom

1 Introduction

In order to meet energy and GHG mitigation targets, many industrialized countries from Europe and North America may have to import biofuels and bioproducts. This will affect economies in Europe and will be influenced by the set-up of sustainability certification schemes. This report will assess the impacts of biofuel/bioproduct trade on economies in Europe.

The implementation of new European legislation (e.g. Renewable Energy Directive) may have significant impact on global biomass/biofuels/bioproducts trade. For example, the European targets on renewable transport fuels will influence the import of biofuels into Europe. On the other hand, legislation in Argentina effectively promotes biodiesel export exclusively, although national biofuel targets are in place. Furthermore, legislation on quality standards of biomass/biofuels/bioproducts may be a trade barrier to imports. This task will assess impacts of new legislation in Europe, USA, Latin America, Africa, and Asia on global biomass/biofuels/bioproducts trade.

Furthermore, future trends of trading regimes of biomass and bioproducts will be identified.

2 Liquid biofuel trade

2.1 International trade

World biofuel production and trade has grown exponentially in the last decade: biodiesel production rose from below 30 PJ (0.8 Mtonnes) in 2000 up to 572 PJ (15.2 Mtonnes) in 2009, while world fuel ethanol production climbed from 340 PJ (16 Gl) in 2000 up to over 1,540 PJ (73 Gl) in 2009 (Lamers, Hamelinck et al. 2011). Markets and trade developments are still strongly linked to support and trade policies while the biofuel industry is also strongly linked to agriculture and the mineral oil industry. A clear distinction can be made between biodiesel and fuel ethanol markets, especially in geographic developments. The differences are primarily connected to the different transport fuel demands, biofuel and agricultural policies, and interests of the respective market players. Global biodiesel production has been dominated by the EU which covered around 60% of the production in 2009; see also Figure 1. Since 2008, the US has covered more than 50% and Brazil slightly more than 30% of the world fuel ethanol production; see also Figure 3 (Lamers, Hamelinck et al. 2011).

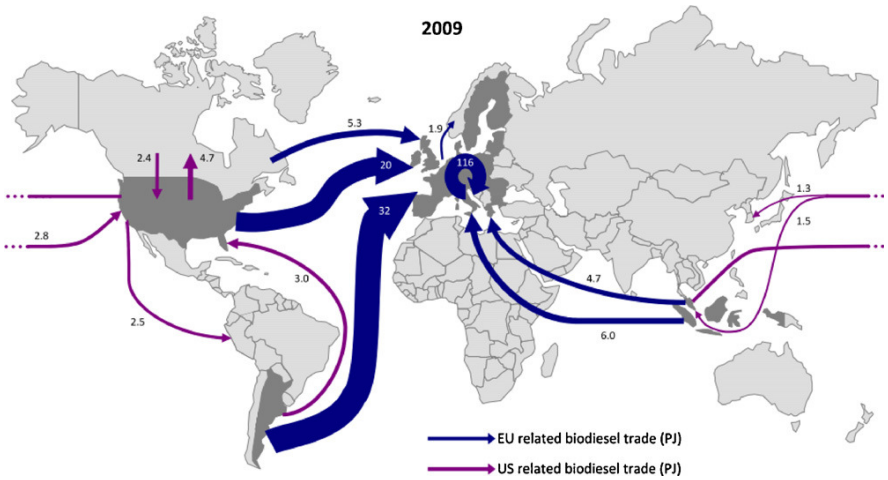


Figure 1: Global biodiesel trade streams of minimum 1 PJ in 2009 (Lamers, Hamelinck et al. 2011)

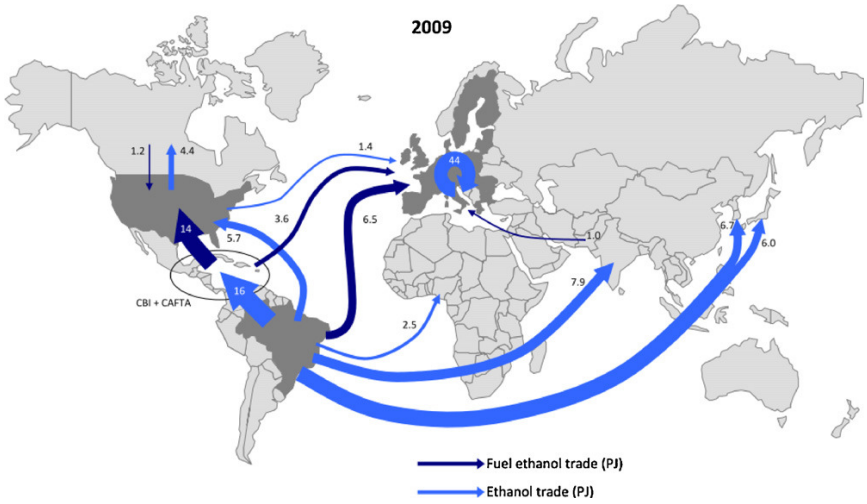


Figure 2: Global fuel ethanol trade streams of minimum 1 PJ in 2009 (Lamers, Hamelinck et al. 2011)

World net biofuel trade reached 120–130 PJ in 2009 and was directed towards the EU for biodiesel (EU imports rose to 92 PJ in 2008 and remained at 70 PJ in 2009) and towards the US and EU for ethanol (the majority originated in Brazil) (Lamers, Hamelinck et al. 2011).

International biofuel trade is both supply and demand driven, whereby the demand side is generally shaped by national support policies. Import duties largely influenced trade volumes, and tariff preferences are the main driver of trade routes (Lamers, Hamelinck et al. 2011).

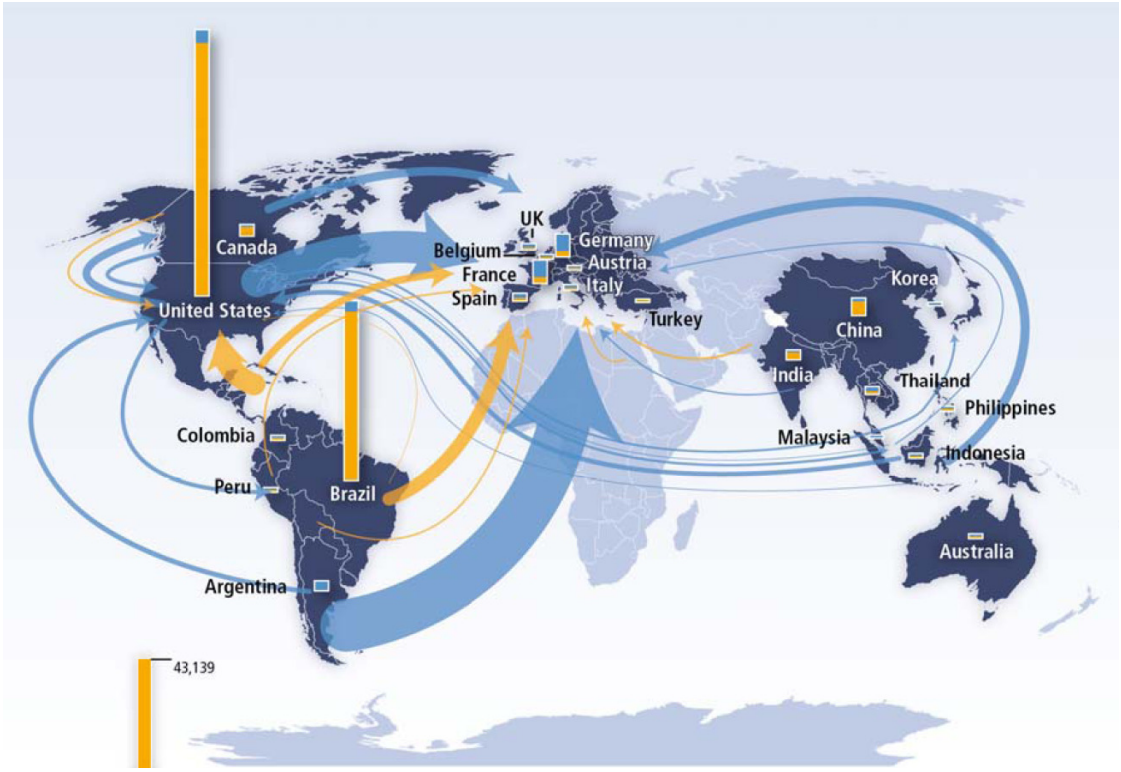


Figure 3: Global biofuels production and main international trade. Source: Lamers (2011); RSER in (Chum, Faaij et al. 2011)

2.2 EU trade

The trade of biodiesel, vegetable oil and fuel ethanol has increased significantly in the EU in the past decade; see Figure 4, Figure 5 and Figure 6.

Key developments for biodiesel (based on Lamers, 2012) include:

- Biodiesel imports have been predominantly from Argentina and Indonesia post-2009, i.e. post EU trade counter measures against US and Canadian biodiesel.
- The Argentinean biodiesel went to Spain predominantly, whose biodiesel industry has faced significant production cut-backs as they are not price-competitive with the Argentinean imports. This is now leading to a new decree in the Spanish biofuel law, practically banning Argentinean imports. Argentina has already filed an official complaint with the WTO on this.
- We expect the biodiesel imports to increase to the EU, despite sustainability criteria, largely due to price competitiveness. The EU is very unlikely to fully use its existing biodiesel capacity.

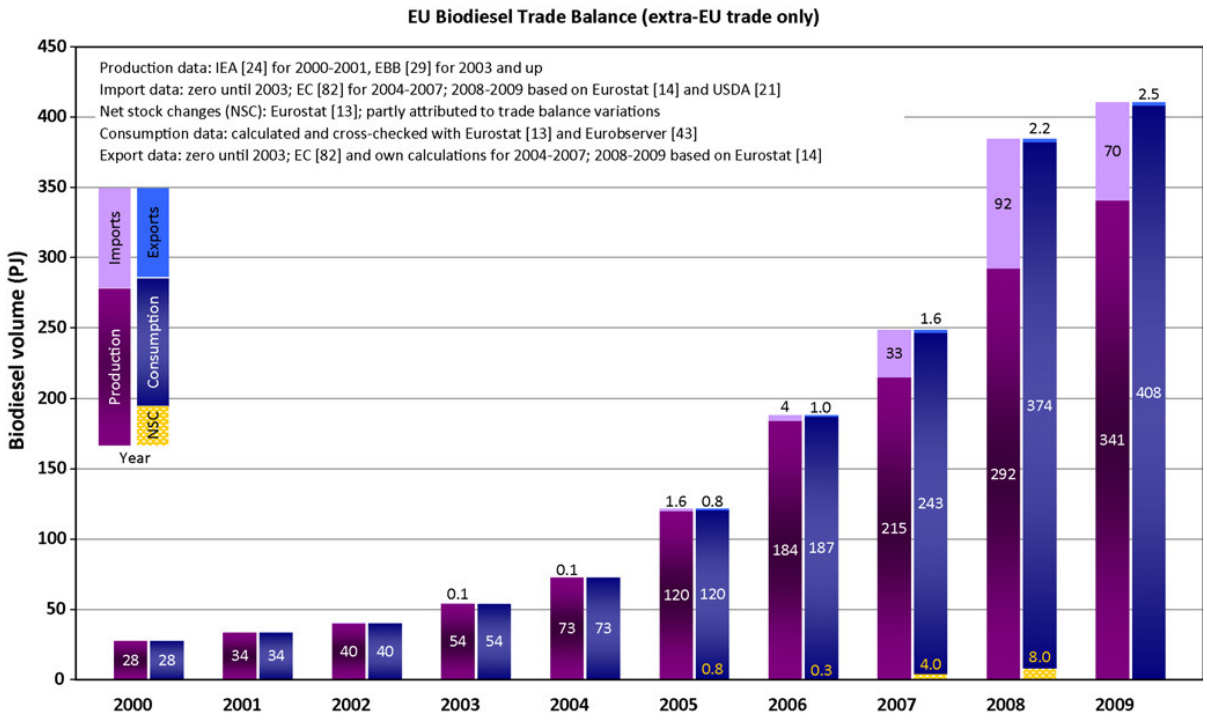


Figure 4:EU biodiesel trade balance 2000-2009 in PJ (Lamers, Hamelinck et al. 2011)

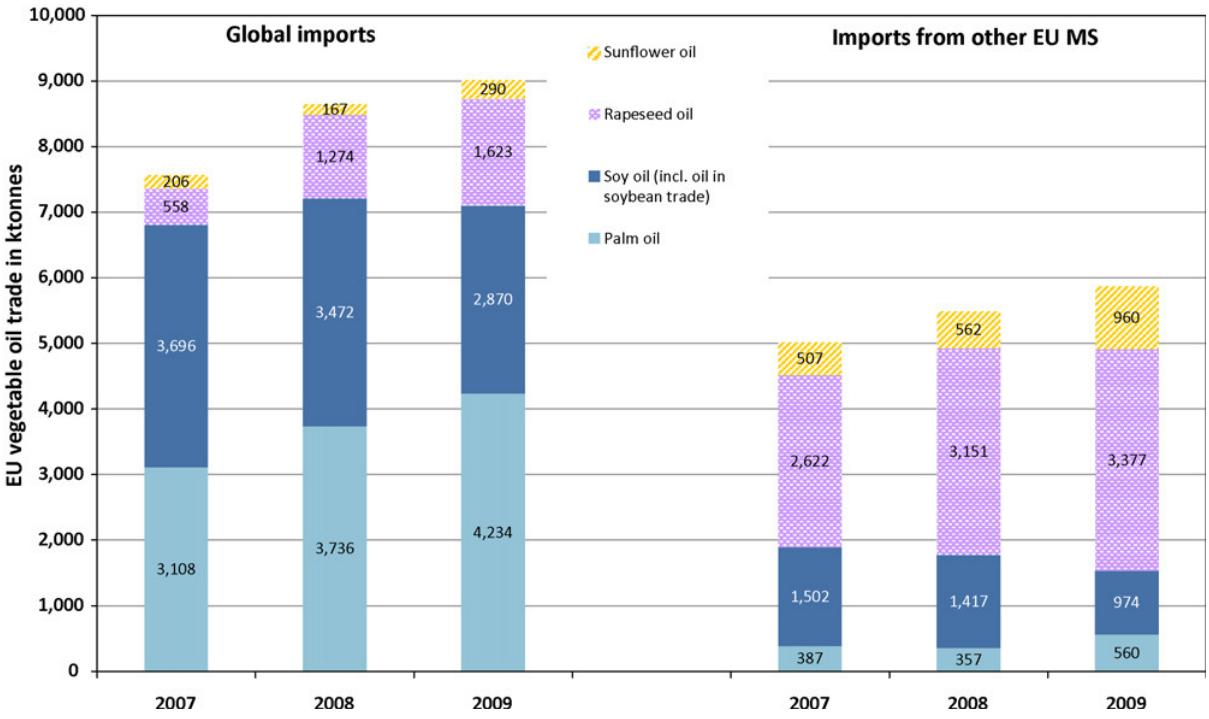


Figure 5:Imports of vegetable oil into the EU of global and other EU member states origin 2007-2009 in ktonnes (Lamers, Hamelinck et al. 2011)

Key developments for fuel ethanol[1]:

- Higher demand growth than capacity growth in the past.

[1] See e.g. Eurobserver (2012). Biofuels Barometer - various issues, Observ'er, IJS, ECN, Eclarean, EC BREC. from http://www.eurobserv-er.org

- Current capacity though is underutilized and has faced significant competition from imported ethanol, primarily the US and Brazil.
- Brazilian imports dropped to marginal shares in 2011 due to a set of reasons that include bad sugarcane harvest.
- At the same time, US production was the highest since years and with a decent corn harvest and a limited local market (E10), US has exported huge quantities of ethanol to the EU. Estimated at over 1.1 Gl (~ 23 PJ).
- The imports are generally not price competitive with local production since the majority of blending mandates require undenatured ethanol which has the highest import tariff. US imports though entered the EU as a chemical compound, blended with petrol i.e. under the commodity code for "Other chemicals" (CN 3824) where they face significantly lower tariffs. The EU has filed a new decree which requires any ethanol imports in concentrations of >70% to be declared as denatured ethanol (whose tariff regime is between undenatured and other chemicals).
- For details on the tariffs and the former "Swedish loophole", see Lamers et al. (2011).

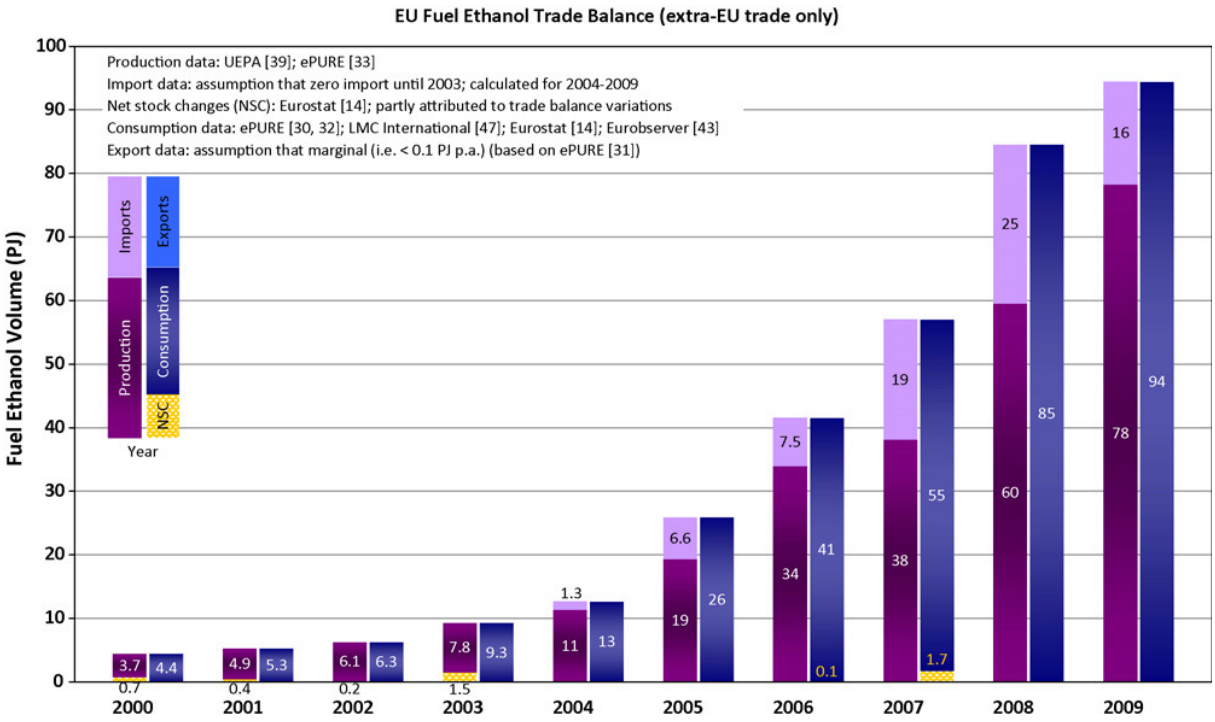


Figure 6: EU fuel ethanol trade balance 2000-2009 in PJ (Lamers, Hamelinck et al. 2011)

3 Solid biofuel trade

3.1 International trade

Wood pellets are the main feedstock of solid biofuel trade. The largest market for wood pellets is in the EU (see Figure 7) and to a smaller extent also in the US, Japan and South Korea due to the local market value for pellets which is partly policy influenced.

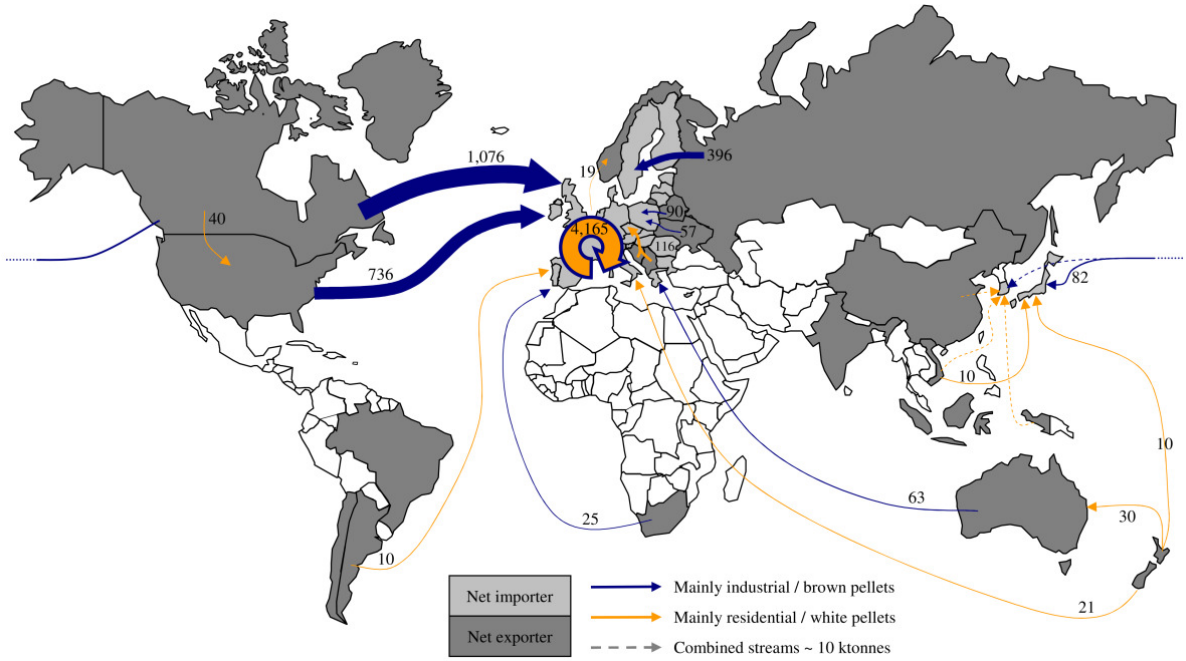


Figure 7: World wood pellet trade streams above 10 ktonnes in 2010 (Lamers, Junginger et al. 2012)

In 2010, the estimated global wood pellet production and consumption were close to 14.3 Mt and 13.5 Mt, respectively, while the global installed production capacity had reached over 28 Mt. Two types of pellets are mainly traded (i) for residential heating and (ii) for large scale district heating, or co-firing installations. The EU was the primary market, responsible for nearly 61% and 85% of global production and consumption, respectively, in 2010. EU markets were divided according to end use: (i) residential and district heating, (ii) power plants driven market, (iii) mixed market and (iv) export driven countries. North America basically serves as an exporter, but also with significant domestic consumption in US. East Asia is predicted to become the second largest consumer after the EU in the near future. The development perspective in Latin America remains unclear.

Five factors that determine the market characteristics are: (i) the existence of coal-based power plants, (ii) the development of heating systems, (iii) feedstock availability, (iv) interactions with wood industry and (v) logistics factors. Furthermore, intervention policies play a pivotal role in market development. The perspective of wood pellets industry was also analyzed from four major aspects: (i) supply potential, (ii) logistics issues, (iii) sustainability considerations and (iv) technology development (Goh, Cocchi et al. submitted 2012).

3.2 EU wood pellet market

The wood pellet market is growing very fast in Europe, partly due to renewable energy policy targets of the EU. Approximately 650 pellet plants produced more than 10 million tonnes of pellets in 2009 in Europe. Total European consumption was about 9.8 Mtonnes, of which some 9.2 Mtonnes is within the EU-27, representing a modest 0.2% of Gross Energy Consumption (75 EJ level in 2008). The prices of most pellet types are increasing. While most markets of non-industrial pellets are largely self-sufficient, industrial pellet markets depend on the import of wood pellets from outside the EU-27. Industrial pellet markets are relatively mature, compared to non-industrial ones, because of their advanced storage facilities and long-term price-setting. However, industrial pellet markets are unstable,

depending mainly on the establishment or the abolishment of public support schemes (Sikkema, Steiner et al. 2011).

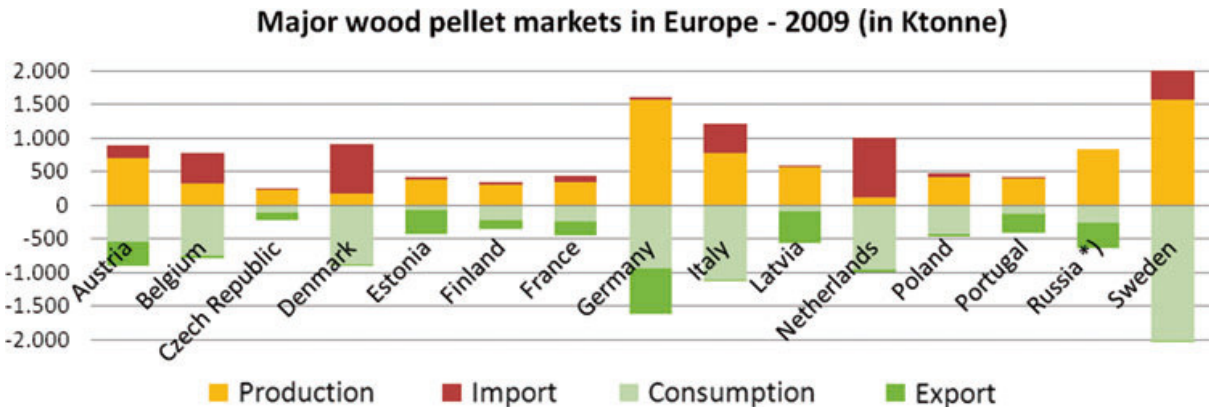


Figure 8: Balance of pellet volumes for the major European country wood pellet markets in 2009 (Sikkema, Steiner et al. 2011).

Future prospects

Following the scenarios as explained in Sikkema et al. (2011), additional demand for woody biomass in 2020 varies from 105 Mtonnes, based on market forecasts for pellets in the energy sector and a reference growth of the forest sector, to 305 Mtonnes, based on maximum demand in energy and transport sectors and a rapid growth of the forest sector. Additional supply of woody biomass may vary from 45 Mtonnes from increased harvest levels to 400 Mtonnes after the recovery of slash via altered forest management, the recovery of waste wood via recycling, and the establishment of woody energy plantations in the future. Any short-term shortages within the EU-27 may be bridged via imports from nearby regions such as northwest Russia or overseas (Sikkema, Steiner et al. 2011).

	Country of origin (extra-EU trade) or country of consign-ment (intra-EU trade)	Destination of export (both intra- and extra-EU trade)	Trade volumes (Ktonne)	
			Volumes recorded by exporting country	Volumes recorded by importing country
Extra EU		Total volumes	64	1769
	Canada	Netherlands	No official custom records available	413
	USA	Netherlands		313
	USA	Belgium		185
	Russia	Sweden		163
	Canada	Belgium		87
	Russia	Denmark		87
	EU-27	Switzerland	46	No records available
Intra EU		Total volumes	3313	2135
	Austria	Italy	292	142
	Estonia	Denmark	256	215
	Lithuania	Denmark	167	36
	Germany	Spain	167	1
	Latvia	Denmark	152	71
	Latvia	Sweden	137	74
	Germany	Denmark	98	30
	Latvia	Estonia	95	40
	Portugal	Netherlands	86	70

Figure 9: Overview of major pellet trade flows in 2009, about or above 100 ktonnes (Sikkema, Steiner et al. 2011)

According to (Goh, Cocchi et al. submitted 2012) the two most important factors that determine the demand for wood pellets, next to support policies, is the presence of coal power plants and types of residential heating systems. On the wood pellet supply side, three main interrelated factors are: resource availability, interactions with the wood industry and logistics issues.

3.3 EU trade

The solid biofuel trade, which is mainly wood pellets, has increased significantly over the last decade in the EU; see **Figure 10**.

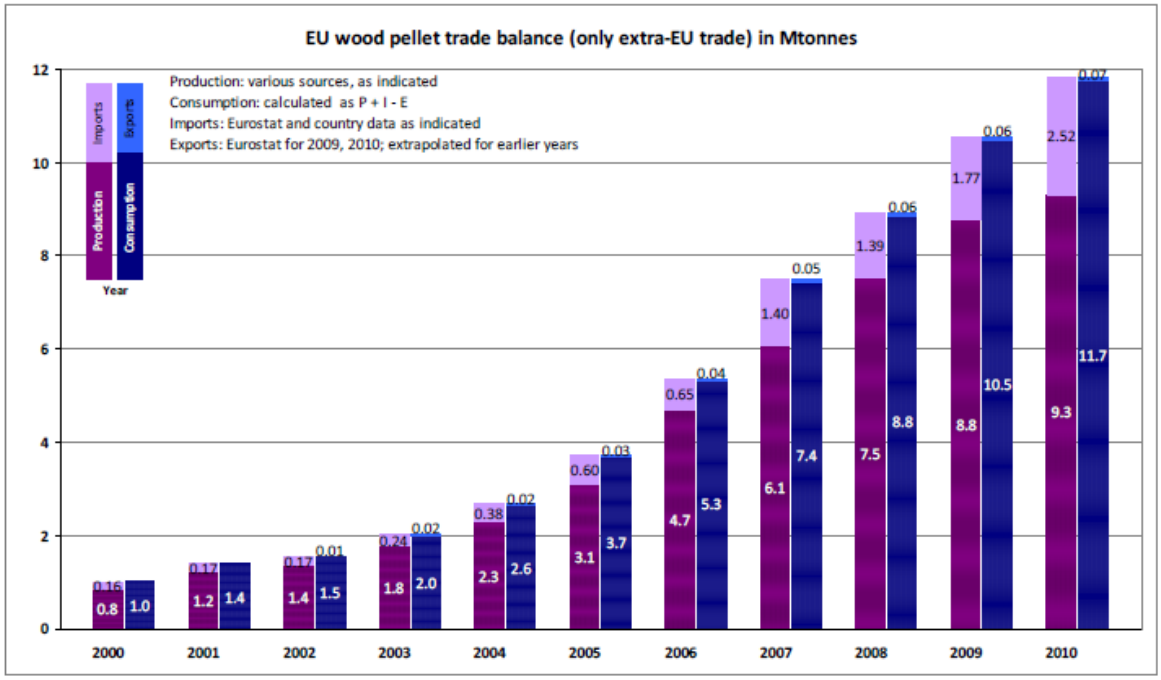


Figure 10: EU wood pellet trade balance (only extra-EU trade) in Mtonnes, (Lamers, Junginger et al. 2012)

There are quite some differences between the Member States if looked in more detail; see Figure 11.

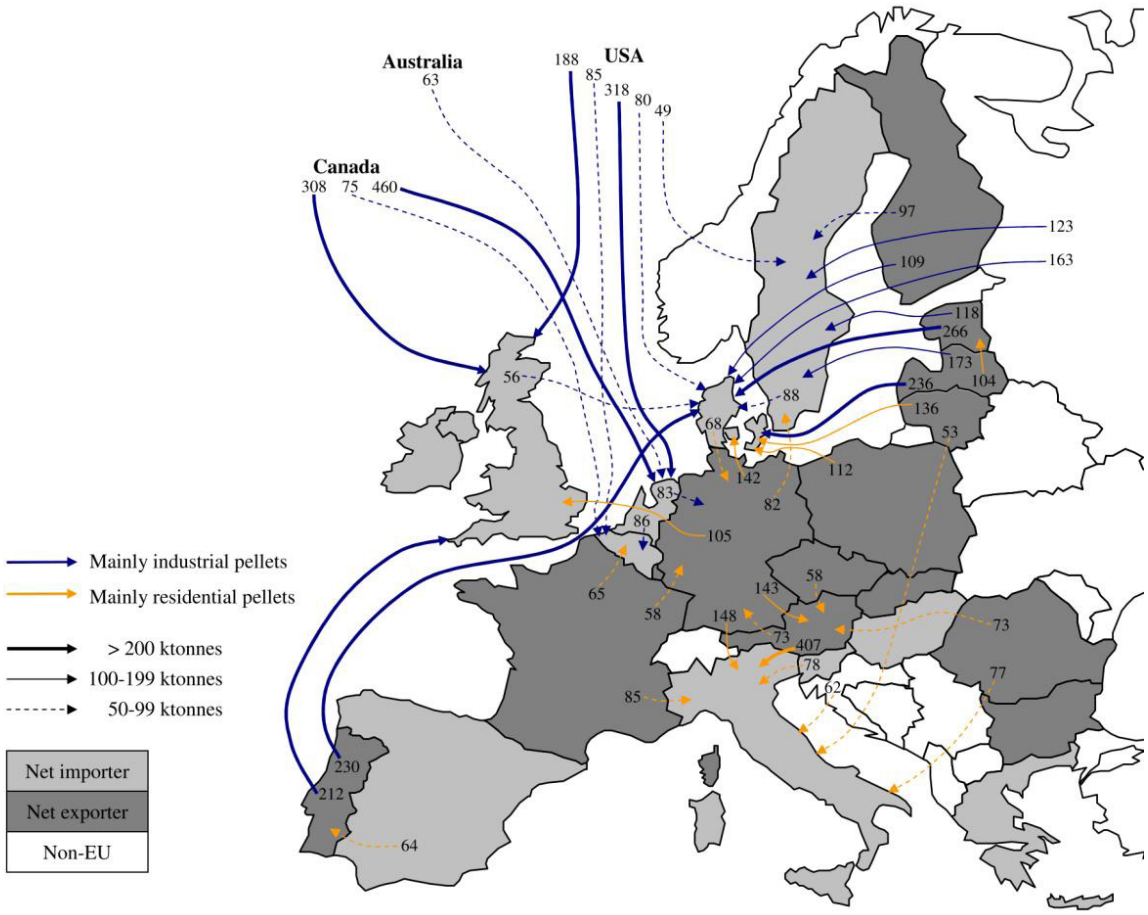


Figure 11: Main wood pellet streams (>50 ktonnes) in Europe in 2010 (Lamers et al. 2012)

The main intra-EU trade routes are from the Baltic States and Finland to Denmark, Sweden and the UK, while high quality pellets are mainly sourced from Germany, Austria and Slovenia and are traded to Italy (Lamers et al. 2012).

Key lessons:

- EU is import dependent on industrial pellets but self-sufficient on residential pellets.
- This external and internal trade streams make this clear.
- The largest external streams come from North America where the US has overtaken imports from (Western) Canada in terms of volumes. These streams follow long-term contracts and are combusted mainly in NL, BE, UK, DK, SE.
- The top residential pellet producers are DE, AT, IT; these are also the largest markets.
- Price advantages from other states (mainly Baltic) have lead to increasing trade in residential pellets.

4 EU Policy

The Renewable Energy Directive (RED) was adopted by the European Union (EU) in 2009. The RED included a 10 percent target for the use of renewable energy in road transport fuels by 2020 and established the environmental sustainability criteria that biofuels consumed in the EU have to comply with. This includes a minimum rate of direct GHG emission savings

(35 percent in 2009 and rising to 50 percent in 2017) and restrictions on the types of land that may be converted to production of biofuels feedstock crops (Laborde 2011).

For biomass production there are several EU member states that have specific policies; see Table 1.

Table 1: Regulations with reference to sustainable biomass production (Pelkmans et al., 2012)

Country / rule ***Energy legislation***	**Description / relevance**	
BE	Minimum requirements for wood pellets (PelletNorm)	Pellets need to be chemically untreated wood from forest with FSC, PEFC or similar label.
FI	National renewable energy plan (NREAP)	Support for electricity production from wood chips and feed in tariff for CHP biogas plants is linked to the Forest Act (1093/1996) => maintaining the biological diversity of the forest.
FR	Fonds "Chaleur renouvelable" (BCIAT)	For forestry biomass, it is asked to follow the good practice guide for leaving enough forest residues in indicated forests.
HU	Feed-in tariff (FIT)	Woody biomass used for electricity production has to come from sustainable managed forests.
SI	Support for CHP (EECHP)	CHPs which use woody biomass from forest with FSC, PEFC are entitled to 10 % higher referential costs.
SI	Support for renewable electricity (EERES)	Power plants which use woody biomass from forest with FSC, PEFC are entitled to 10% higher referential costs.
Forestry regulations		
FI	Act on the Financing of Sustainable Forestry	Specific promotion of the utilization of wood felled in connection with the tending of young stands to be supplied for energy use in view of maintaining the biological diversity of forests.
Agriculture legislation		
DK	Order on special support to farmers for the establishment of perennial energy crops	Investment support for perennial energy crops. The order sets the priorities and conditions for obtaining support, including which types of land can be used.
IE	Bioenergy Scheme for production of non-food crops	Focus on miscanthus and willow: they should comply with Cross Compliance and codes of practice should be followed. Land use for a particular crop/forest must be suitable for that particular use e.g. land suitable for willow plantation, while at the same time avoiding direct competition with food crops.

UK	Energy Crops Scheme	Applicants need to present a map of the farm including the area of the energy crop plantation, according to guidelines provided. Planting is prohibited on permanent pasture and a variety of designated land types.
NL	Decree on the use of manure	Defines when the digestate of a digestor can be used as fertilizer (limitations to certain biomass inputs). Important impact on the potential feedstocks for biogas production
Waste legislation		
NL	National Waste Management Plan	Includes the criteria of biomass that are considered waste and for which stricter emission requirements apply (BVA).

For electricity production there is very detailed information on the instruments that the different member states use. Ragwitz, Steinhilber et al. (2012) give an overview of main policy instruments that are used in the renewable electricity sector in the EU.

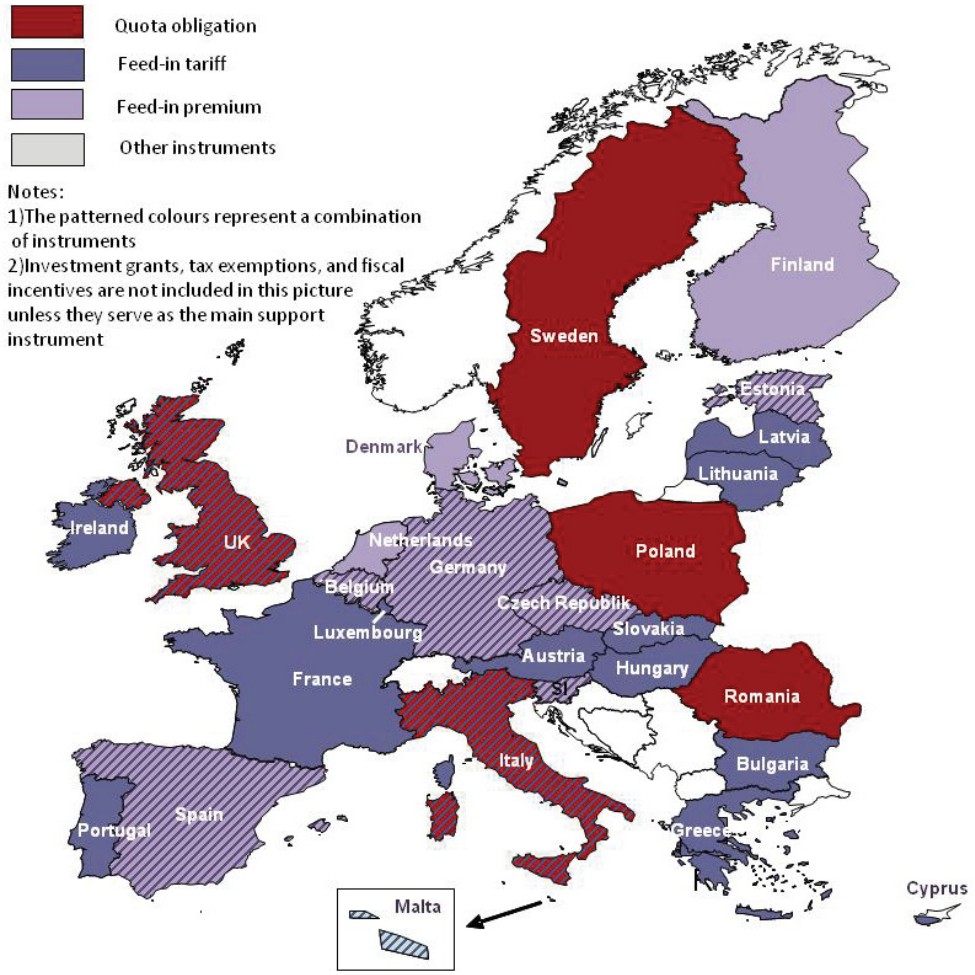


Figure 12: Renewable electricity sector-support instruments in the EU (Ragwitz, Steinhilber et al. 2012)

The three main support schemes are feed-in tariffs, feed-in premiums and quota obligation systems, of which the first two schemes are applied as the main instrument in 20 Member states. A trend towards feed-in premiums can be observed (Ragwitz, Steinhilber et al. 2012). Quota systems with tradable green certificates (TGC) are applied in Belgium, Italy, Sweden, the United Kingdom, Poland and Romania, often in combination with feed-in tariffs for small-scale projects or specific technologies (Ragwitz, Steinhilber et al. 2012).

4.1 Influence of trade liberalization

Two scenarios are defined that relate to different trade policies: 1) A status quo trade policy scenario that leaves all currently existing import tariffs on biofuels unchanged in 2020 and 2) a free trade scenario that eliminates all tariffs on all biofuel imports, except for the contingent anti-dumping levy on biodiesel imports from the US (Laborde 2011).

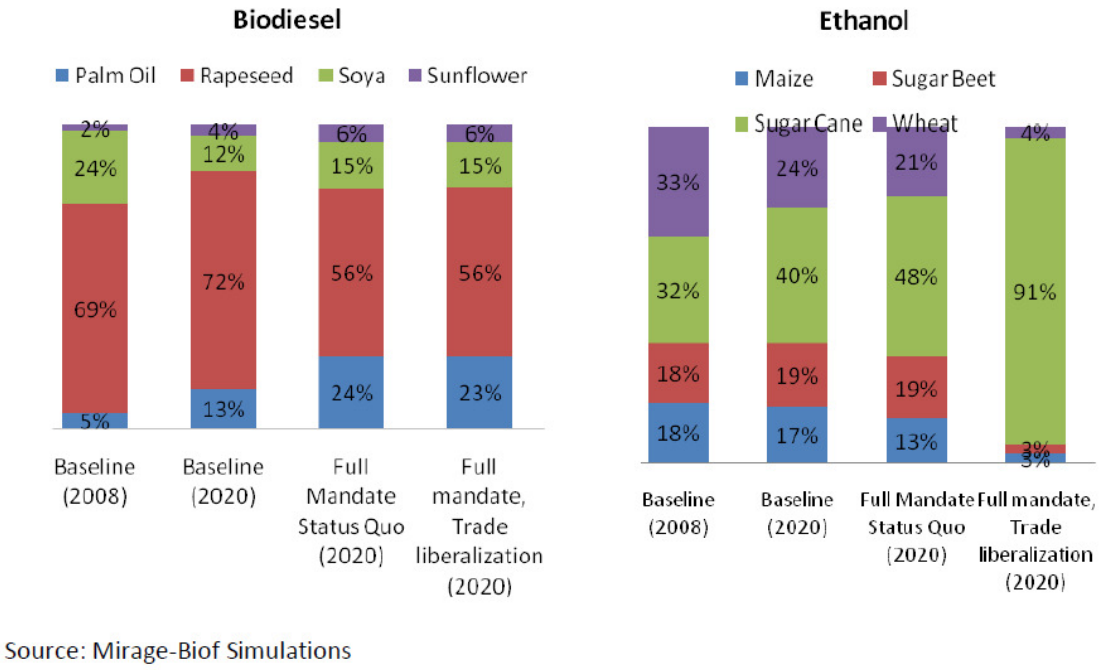
The way in which Member States intend to implement the EU mandate is expected to result in an increase in the relative consumption of ethanol to biodiesel (from 17/83 in 2008 to 28/72 in 2020), furthermore the scenario under the trade policy status quo reinforces local production of ethanol. Under trade liberalization, EU ethanol production declines, with sugar beet- and wheat-based ethanol most affected. As a result, local production capacity and feedstock production are dominated by biodiesel production. With trade liberalization, biodiesel represents 92.5 percent of total EU biofuel production. Overall, EU biofuel production will increase from 10.1 Mtoe in the baseline to 20.9 Mtoe without trade liberalization and 17.8 Mtoe with trade liberalization.

	Palm Oil	Rapeseed	Soya	Sun-flower	*All Biodiesel*	Maize	Sugar Beet	Sugar Cane	Wheat	All Ethanol
Structure of consumption in 2008										
Baseline	4	57	20	2	***83***	3	3	5	5	***17***
Structure of consumption in 2020										
Baseline	11	60	10	3	***83***	3	3	7	4	***17***
No Trade liberalization	17	41	11	4	***72***	4	5	13	6	***28***
Full Trade Liberalization	17	41	11	4	***72***	1	1	25	1	***28***
Additional Mandate Composition										
No Trade liberalization	22	26	12	5	***65***	4	6	18	7	***35***
Full Trade Liberalization	22	26	12	5	***65***	-1	-1	38	-1	***35***

Source: Mirage-Biof Simulations

Figure 13: EU consumption pattern by feedstock (%) (Laborde 2011)

An important change in consumption patterns can be noted looking at the baseline evolution from 2008-2020: soybean biodiesel has shrunk, due mainly to import restrictions on US biodiesel in 2009 but also to the relative price increase of soybeans, driven by Asian growth and the needs of the livestock sectors. Similar effects take place for wheat among ethanol feedstocks (Laborde 2011).

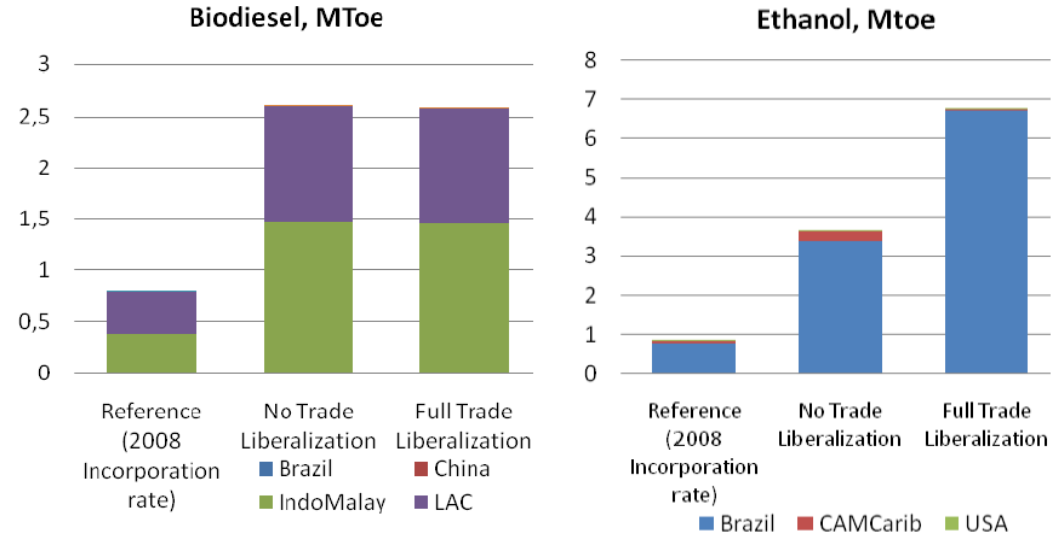


Source: Mirage-Biof Simulations

Figure 14: EU consumption pattern by feedstock, by type of biofuel (Laborde 2011)

The EU additional mandate leads to an increase of 50 percent of the global biodiesel market; however, this remains much smaller than the ethanol market (15 percent market share). The EU trade policy option does not significantly affect the biodiesel/ethanol ratio, since it is considered that the EU additional mandate is fixed in its composition. In addition, the biodiesel/ethanol markets are quite segmented (trucks vs. cars and mandate policies) in both Brazil and the US, leading to no shift from one biofuel to another in these countries in response of the EU shock.

Figure 15 shows the evolution of biofuel imports by the EU by type of biofuel and by origin.



Source: Mirage-Biof Simulations

Figure 15:EU imports of biofuels, Mtoe, 2020 (Laborde 2011).

Biodiesel imports will triple with the scenario (additional mandate), while consumption will double. The EU market will become more open due to the evolution of relative competitiveness between local and domestic sources. Trade liberalization does not have direct effects on the import of biodiesel when compared to the trade status quo scenario and, with the elimination of US exports in the baseline, the main suppliers are South East Asia (Indonesia and Malaysia based on palm oil) and the rest of Latin America (Argentina based on soybean oil). For ethanol, the effects are much stronger. The additional mandate increases the imports five-fold without trade liberalization and nine-fold with trade liberalization. The multilateral trade openness will also eliminate small exports from Caribbean countries that would have otherwise benefited from preferential market access through the CARICOM Economic Partnership Agreement (Laborde 2011).

4.2 Future trends

The RE-shaping project (see http://www.reshaping-res-policy.eu/) has developed projections for the consumption of biomass for bioenergy in Europe. Four scenarios are developed by the project: a Business as Usual case (BAU) with current implemented policies and without any adaptation before 2020 and a Strengthened National RES Support case (SNP) that presupposes the meeting of the RES 20% targets by 2020 and assumes the continuation of fine-tuning of national RES policies (increasing cost-efficiency and effectiveness) and mitigation of non-cost barriers. With respect to biomass trade, both the BAU and SNP scenario cases were assessed with and without sustainability criteria on biomass (BAU-sb and SNP-sb); see Figure 16 where the consumption of biomass is projected for 2020 per EU member state.

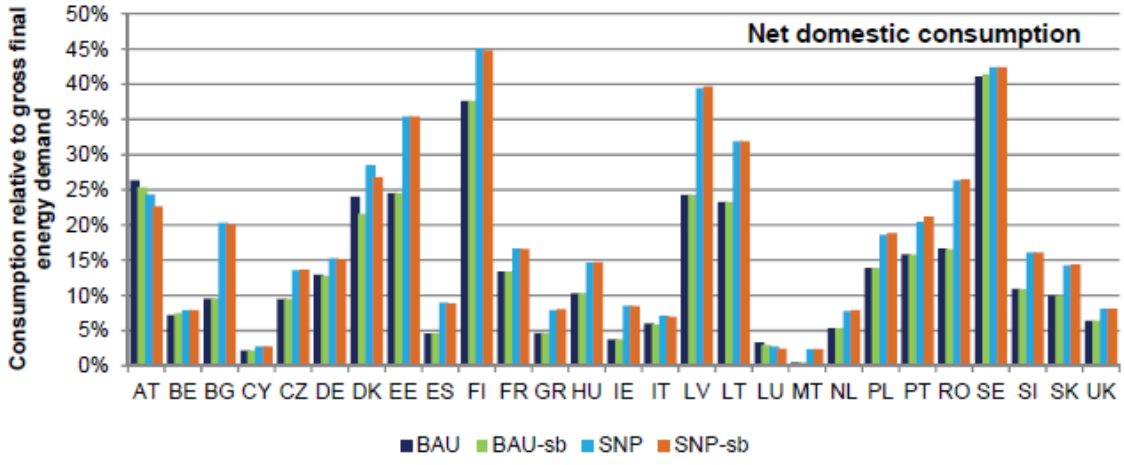


Figure 16: Net domestic consumption of biomass for bioenergy with respect to total gross final energy demand in 2020 (Ragwitz, Steinhilber et al. 2012).

In the BAU scenario a total consumption of biomass for bioenergy in the EU-27 is projected to be 148 Mtoe in 2020, 147 Mtoe in the BAU-sb scenario, 174 Mtoe in the SNP scenario and 173 Mtoe in the SNP-sb scenario. Germany (18-20%), France (15%), Sweden (8-10%) and Poland (7-8%) are the largest consumers of total EU-27 biomass consumption, respectively. With respect to the domestic final energy demand, the largest consumers include biomass resource-rich countries such as Sweden, Finland and the Baltic States (Ragwitz, Steinhilber et al. 2012).

Figure 17 shows the domestic production and the import from both EU and non-EU countries using the same scenario's for 2020.

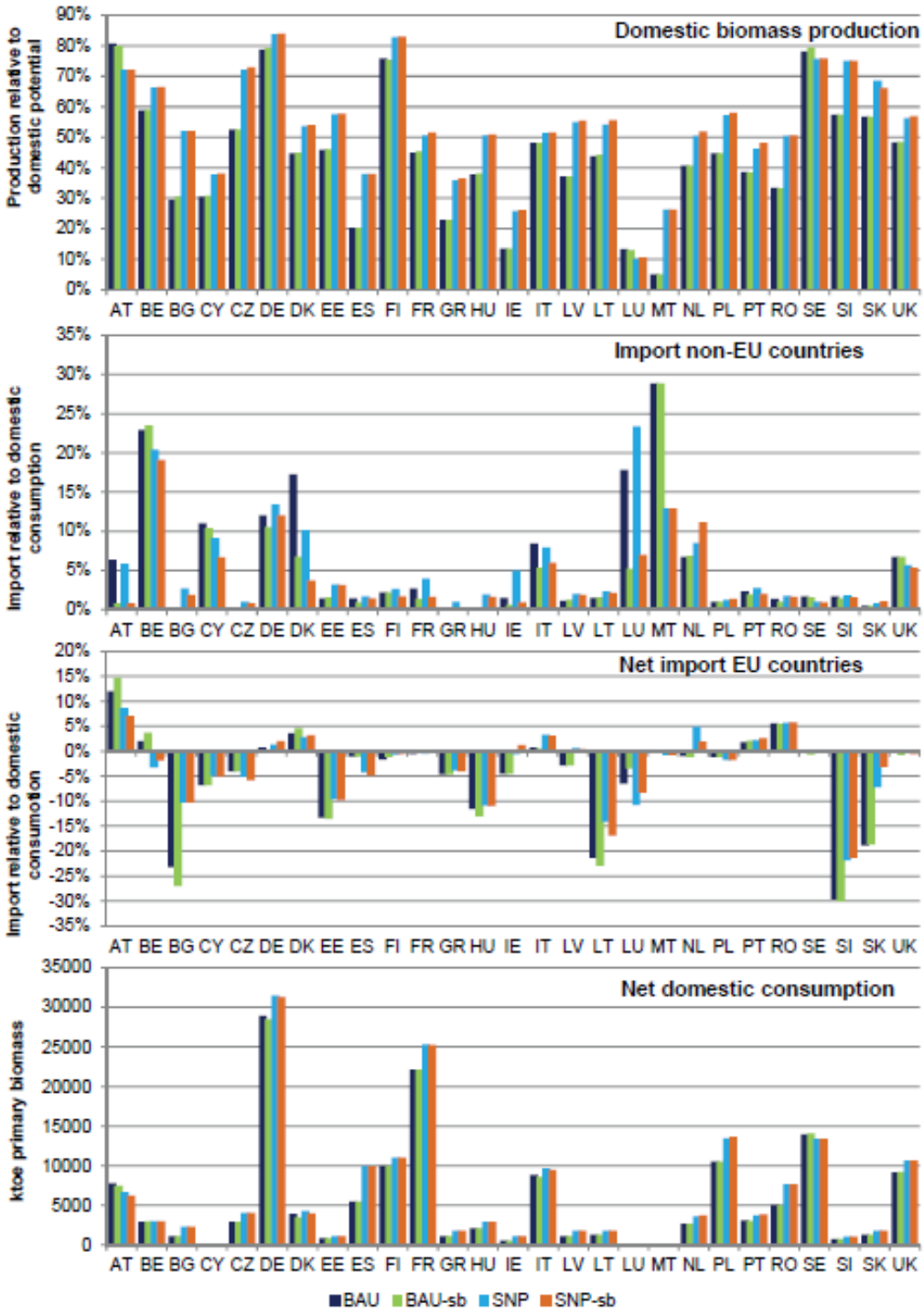


Figure 17: Domestic production, net import from non-EU and EU countries and domestic consumption of biomass for bioenergy in 2020 (Ragwitz, Steinhilber et al. 2012)

The total intra-European trade in the EU-27 in the scenarios is projected to be 2.3 to 2.4 Mtoe (equivalent to 5.6 - 5.9 Mt wood pellets) in the BAU and BAU-sb cases, respectively, and increases to 2.9 Mtoe (equivalent to 6.7-6.8 Mt wood pellets) in the SNP and SNP-sb cases in 2020. In 2010, total intra-European trade of wood pellets was 1.8 Mtoe (4.2 Mt) (Cocchi, Nikolaisen et al. 2011). Most EU-27 Member States are both importers and exporters of biomass (Ragwitz, Steinhilber et al. 2012).

Total imports of non-EU biomass are projected to increase 7 to 8-fold in 2020 depending on the scenario, with 1.1 Mtoe (2.6 Mt) wood pellets being imported from non-EU countries to the EU in 2010. Ranges of 6.4 to 8.3 Mtoe (equivalent to 15 - 19 Mt wood pellets) are projected for 2020 in the BAU-sb and BAU scenario cases respectively and 7.6 to 9.7 Mtoe (equivalent to 18 - 23 Mt wood pellets) for 2020 in the SNP-sb and SNP scenario cases respectively. Non-EU biomass resources are more sensitive to sustainability criteria due to costs of certification and greenhouse gas emissions related to the logistic chains for long transport routes. Imports from non-EU biomass resources are therefore less significant in the scenarios with sustainability criteria (Ragwitz, Steinhilber et al. 2012).

5 Sustainability certification in the EU

5.1 General introduction

The increased utilization of bioenergy has led to many changes in biomass markets, including the development and implementation of sustainability certification schemes. A variety of sustainability certifications are applied primarily to comply with bioenergy regulatory frameworks. Biomass trade and market are most likely to be influenced by the implementation of these schemes. The question is: to what extent has the requirement (or the voluntary commitment) to meet sustainability criteria (proven by the use of certification schemes) been changing markets and trade flows?

The effects of certification on biomass production, availability of supply and trade can be multi-fold: certain producing areas or resources can be excluded from supplying specific markets (which can in turn enhance opportunities and market access of other potential suppliers), can increase costs of production and therefore feedstock supplies, or can have a facilitating effect due to the avoidance of conflicts and realisation of benefits (both ecological and socio-economic) associated with market access. Such mechanisms have been described for a few regions and resources (Smeets and Faaij 2010). Within IEA Bioenergy a strategic study was initiated among Tasks 40, 43 and 38 to monitor the actual implementation process of sustainability certification of bioenergy, evaluate how stakeholders are affected by certification initiatives, quantify the anticipated impact on worldwide bioenergy trade, assess the level of coordination among schemes, and make recommendations to remove barriers which may depress markets and reduce sustainable trade.

Sustainable development consists of three fundamental components: environmental, social and economic sustainability. The vast majority of regulations in the EU on energy, environment, agriculture and forestry (52 out of 57) include environmental sustainability provisions. On the other hand, 14 out of 57 included economic sustainability principles (either favouring local biomass or protecting local industry). No specific regulations refer to social sustainability.

5.2 Liquid biofuels

5.2.1 Sustainability certifications for liquid biofuels

The Renewable Energy Directive (RED) requires Member States to generate 20 per cent of energy from renewable sources by 2020, and for 10 per cent of transport fuels to be made up of renewable resources. These Directives include sustainability criteria with which biofuels contributing to these targets, whether produced within the EU or elsewhere, must comply.

Currently there are 12 voluntary sustainability certification schemes recognized by the EU-RED.

The United Kingdom and the Netherlands are the forerunners in the development and implementation of sustainability certification. In UK, before 2012, sustainability assurance schemes were divided into Environmental and Social Standards and these are split into three levels: RTFO sustainable biofuel meta-standard (RTFO); Qualifying Standards (QS) and Other Standards. In December 2011, the RTFO Order was amended to implement the sustainability criteria of the RED. This introduced mandatory sustainability criteria which biofuels must meet for those fuels to be eligible for Renewable Transport Fuel Certificates. In the Netherlands, sustainability of biofuels is assured according to sustainability schemes (usually a certification system) recognized by the European Commission or accepted by the Dutch government.

5.2.2 Impact of sustainability certifications on liquid biofuel trade and market

Sustainable consideration has been an important element but never the sole factor that affect the trade and market. In reality, each individual bioenergy market has its own characteristics in terms of resource availability, geographical factors, climates and economic factors. Ultimately, the markets are shaped by cross-country variation in policies development. Nevertheless, the introduction and development of a wide range of sustainability schemes has imposed significant impact to the market and trade.

Availability of sustainable certified biofuels

The biofuels market is dynamic, involving international and intersectoral trades. At current consumption level, the market still provides sufficient liquidity (availability / supply) in sustainable biofuels supply. There are always competitions between biofuels made from different feedstock. In fact, some feedstocks are more competitive in terms of sustainability. For example, recently SME (Soy Methyl Ester) has struggled to come into Europe because the GHG default does not meet the sustainability minimum threshold. On the other hand, certification systems may help biofuels made from certain feedstock which have been controversial for their sustainability, such as palm oil from Malaysia and Indonesia, in terms of proving their sustainability.

However, the biggest factor that affects the trade flows are feedstock prices, and feedstock prices are closely related to the harvest. During a bad harvest, feedstock prices may rise and production may drop. To avoid or minimize such risk, compliance markets such as the United Kingdom allows those producers producing a surplus of product to sell compliance tickets to those that are short. Moreover, operators may be able to “buy-out” directly from the compliance authority at a high price in times of severe disruption. This is effective in smoothing out any short term supply disruptions.

Compatibility of sustainability certification schemes

In Europe, which is the biggest and most lucrative market, until September 2012 twelve schemes are accepted by RED (ISCC, Bonsucro EU, RTRS EU RED, RSB EU RED, 2BSvs, RBSA, Greenergy, Ensus, Red Tractor, SQC, Red Cert and NTA8080). Although proliferation of sustainability certification schemes may greatly increase the complexity of liquid biofuels trades, however, given the fact that the existing schemes are already well-established and have been working in a stable way, accepting more schemes may open up more trade channels.

Competition between certification is generally welcomed by the market actors. But, the schemes are lacking harmonization and mutual acceptance. There are cases where different

schemes were being used and accepted in the same chain, and they do not necessarily recognize each other, e.g., ISCC accepts volumes of biofuels from the other seven schemes, but not the other way round.

Administrative barriers

The administrative burdens that stem from sustainability certification are significant and have created barriers in biofuels trade. For example, in Germany, even though certain schemes were approved by the EU committee, Germany takes about half to a year to incorporate them into the Nabisy database. There are resource constraints in the commission for approving schemes and approving improvements to schemes. This has caused serious delays to approval and will cause delays to improve approved schemes.

Technical barriers

At the production side of the supply chain, some feedstocks rely on aggregators to collect the biomass from thousands of farms. In this circumstance it is almost impossible to collect reliable data and this may cause potentially sustainable feedstock to be ruled out.

5.3 Solid biofuels

5.3.1 Sustainability certifications for solid biofuels

At the time of writing, the EU-RED has not yet introduced sustainability criteria for solid biofuels, while numerous voluntary sustainability schemes are being developed or implemented. To improve the efficiency and creditability of the market, harmonization of these schemes may minimize confusion among the market actors and reduce unnecessary cost burdens. In reality, to secure flexibility in supply and demand and to minimize uncertainties, main industrial wood pellets users have initiated an effort to harmonized various sustainability certification schemes for wood pellets, namely IWPB initiatives. A harmonized sustainability certification scheme would improve the flexibility of biomass-fired power plants in managing their supply. As they rely on long-term procurement contracts, it is in the plants' best interest to retrade their wood pellet supply horizontally among each other, when there is excess or shortage in supply. Hence, contract forms and legal conditions must be harmonized to ensure appropriate trading conditions (Goh, Cocchi et al. submitted 2012).

In the absence of mandatory EU-wide sustainability criteria for solid biomass, it is quite likely that a number of individual Member States unilaterally will develop (further) sustainability criteria, while others maintain the status quo. A few individual member countries have defined an own sustainability obligation, for e.g. the UK (ROCs) and Belgium (Green Certificates). The Netherlands is also considering installing sustainability criteria for solid biomass, and therefore developed the Dutch Biomass Protocol.

Sustainable forest management schemes

The two largest forestry certification systems in Europe (and in the world) are the Forest Stewardship Council (FSC) and the Programme for the Endorsement of Forest Certification Schemes (PEFC). Both concentrate on sustainable forest management by using independent third party assessment of forestry practices against a set of forestry standards. The FSC Principles and Criteria (P&C) set out best practices for forest management. In many countries, FSC Regional or National Standards are developed by FSC working groups. Regional and national standards transfer the P&C to the specific conditions and context found in each country or region. PEFC is an umbrella standard that recognizes existing

national forestry standards, such as SFI, CSA, ATFS and etc., when certain conditions are met. In some cases, such as the UK, the UKWAS scheme was endorsed by PEFC and approved by FSC for use in their UK certifications. These forestry standards have significant potential to be used to assess sustainable utilization of forestry biomass for energy production.

Industrial schemes for sustainable use of biomass for energy

Green Gold Label: Green Gold Label was founded in 2002 by Essent (a power company from the Netherlands) and Skal International (now Control Union Certifications). The Green Gold Label programme is a certification system for sustainable biomass. It covers production, processing, transport and final energy transformation.

Laborelec Label: On behalf of GDF-SUEZ/Electrabel (a power company from Belgium), Laborelec and SGS have put in place a verification procedure applied to each biomass production unit. In this work, this system is named as Laborelec Label.

NTA 8080: Based on Dutch and European sustainability criteria, a certification system for biomass for energy purposes has been developed by a diverse group of stakeholders coordinated by NEN. The criteria have been turned into verifiable requirements. The certification system offers a way for suppliers and buyers of biomass to distinguish sustainable products.

ISCC PLUS: A new certification system for food, feed, technical/chemical (e.g. bioplastics) and other bioenergy (e.g. solid biomass) applications developed as an extension of ISCC. An overview on the system was given at the Second ISCC Global Sustainability Conference and General Assembly in Brussels on February 8, 2012. The consultation period will end May 31st, 2012. ISCC PLUS offers an opportunity for already certified conversion units (ISCC DE or ISCC EU) to efficiently extend sustainability certification to food and feed products (e.g. oil seed meal, DDGS, oil for food and other uses).

IWPB: Initiative Wood Pellets Buyers (IWPB) is a working panel grouping the major European utilities firing wood pellets in large power plants GDF SUEZ, RWE, E.On, Vattenfall, Drax Plc, and Dong, as well as certifying companies SGS, Inspectorate, and Control Union. Laborelec participates in this work panel as a technical expert. They propose to use the GGL foundation as the new governance structure for the new sustainability standard based on the IWPB principles.

5.3.2 Impact of sustainability certifications on solid biofuel trade

The information used has been derived from a number of sources, using reports, interviews and dialogues conducted with various market actors. (IEA Bioenergy T40/43/38 2012) IEA Bioenergy T40/43/38 Intertask Project – Ongoing work) http://www.bioenergytrade.org/ongoing-work/monitoring-sust-certification-of-bioenergy.html

Legislation factor

Different member states in Europe have significant variations in policies and regulations. For example, the UK has very stringent sustainability requirements compared to the other member countries. Currently Green Gold Label is the only scheme approved by Ofgem. The Netherlands is also considering implementing requirements that are similar to the EC recommended sustainability criteria. In other words, the decision of government on scheme acceptance will have impact on the trade flows – first, the volume of sustainable certified biomass will increase steadily corresponding to the policies; and only biomass certified with these schemes will be imported to the specific market.

Availability of sustainable certified biofuels

Currently there are a few industrial schemes available for solid biomass, particular for wood pellets as listed in the previous section. However, most of these schemes are designed primarily for their own companies, such as Laborelec Label and Green Gold Label. Furthermore, the use of NTA 8080 for wood pellets is still limited, and ISCC PLUS is still under development. There might be difficulties for companies without their own schemes in sourcing sustainable certified wood pellets. Nevertheless, huge volumes of biomass resources are available. It is expected that a harmonized system, which is being developed under IWPB, will not only greatly facilitate trade process but also open up more trade channels.

Compatibility of sustainability certification schemes

Incompatibility of different schemes reduces the flexibility in supply chain. Due to technical and cost considerations, horizontal trading between large biomass power plants has become essential. But, incompatibility between different sustainability certifications has become one of the factors that restrict the trading of wood pellets between power plants.

Harmonization of schemes seems to be an effective solution; however, it is also very challenging to make a harmonized scheme. The challenges to bring all schemes and systems into conformity mainly come from the disparity in sustainability requirement between the Member States.

Stringency of sustainability requirements

Due to differences in sustainability requirements, certain producing areas or resources can be excluded from supplying specific markets (which can in turn enhance opportunities and market access of other potential suppliers). As mentioned above, UK, the Netherlands and Belgium may have the most stringent sustainability requirements among the Member States. Biomass from certain areas might not be able to meet the requirements in these countries, and hence are prevented to enter these markets. For instance, sourcing of wood pellets from Russia to the Netherlands has been stopped due to the consideration of GHG emission reduction requirement.

Technical barriers

Many different sustainability systems exist along the supply chain. They cover different parts of the supply chain, and may be different for different geographic areas and feedstock. On the one hand, this may be a potential trade barrier as certification is a highly administrative process which is time consuming and costly. On the other hand, interaction and mutual acceptance of principles and criteria of existing schemes, which are already well-established and cover particular aspects of the supply chain is an opportunity to reduce administrative requirements. In the future, benchmarking and acceptance of schemes under policy requirements for renewable energy may further alter the trade flows to shift to sustainable biomass supply sources.

Vertical integration

Some power companies have decided to invest in vertical integration (considering the value chain, expansion upstream). Many energy companies consider that adapting and developing bioenergy is a strategy to enhance the long term value of the company. Investing in vertical integration provides not only security of supply but also traceability of supply chain. An example of vertical expansion would be the establishment of the world's largest wood pellet factory in Georgia (USA) by RWE Innogy. These wood pellets are shipped to the Netherlands, where the wood pellets are cofired in the Amer power station.

Currently there is a difference between biomass that is used for e.g. paper production or wood production and the use for biofuels. The sustainability criteria that are required by the EU only apply to biomass used for liquid biofuels. Ideally, sustainability criteria should be meant for all uses of biomass. This would also limit the level of confusion that sometimes occur when different markets have different requirements. On the other hand certification schemes could become a barrier for developing countries if there is a large difference in technological capabilities and investment capital. A slow pace of implementation and assistance in capabilities in these countries could help to overcome this issue (Pelkmans, Devriendt et al. 2012).

6 Comparison of different certification schemes

The European market is heavily relying on EU-recognised voluntary systems for ensuring the sustainability of biofuels and bioliquids. In addition, market demand is increasing for biomass for heat and electricity generation for which the sustainability is to be guaranteed by means of certification systems such as:

- Bonsucro;
- ISCC (EU version)
- NTA808/81;
- REDcert (German version, the EU version was not public during yet)
- Roundtable on Sustainable Biofuels (RSB);
- Roundtable on Sustainable Palm Oil (RSPO);
- Roundtable on Responsible Soy (RTRS);
- 2BSvs

In all cases, with exception of REDcert, the EU versions of these systems were evaluated. The evaluated systems deal differently with how to include the RED requirements in their system. Basically, there are four approaches: the system itself is the EU-RED version (2BSvs), the EU-RED version is an “add-on” module and must be used in conjunction with the main system (RTRS, RSPO, Bonsucro), the system has two separate versions of which one version is the EU-RED version (REDCert, ISCC, RSB), or the system uses a step-in approach. For some systems the EU-RED version is stricter than their original version (e.g. ISCC) while this is the opposite for other systems (e.g. NTA8080).

Sustainability of biofuels is assured through the system specifications and by the scope of the system (i.e. its principles). The evaluated systems differ in their coverage of sustainability principles; some systems (such as 2BSvs) focus primarily on the EU-RED criteria while others (e.g. the roundtable initiatives) aim to cover social, environmental and economic principles as well. The systems also differ in the coverage of the supply chain; main differences can be found in both the end (e.g. re-blending included in Chain of Custody audit or not) and start of the supply chain. Although farmers are included in the audits of all certification systems, they are not in all cases the first certificate holder. The form of auditing (field or desk audits, sampling conditions) for farmers also shows large differences between the systems, which has its impact on the level of assurance. See Figure 18 for the results of the comparison.

	RSB	RSPO	RTRS	Bon-sucro	2BSvs	NTA8080	REDcert	ISCC
1. Management of system itself								
Transparency	++	+	+	-	-	0	0	+
Stakeholders	++	++	++	++	--	+	--	+
Complaints	++	++	++	++	+	++	+	++
2. Quality requirements for auditors								
Impartiality	++	++	++	++	+	+	++	++
Personnel competence [1]	++	+	++	++	--	+	0	0
Accreditation [2]	+	++	++	+	+	++	+	+
3. Auditing procedures								
Frequency certificate	++	0	+	0	0	+	-	+
Type of audits	0	+	++	++	--	+	++	++
Process requirements	+	++	+	++	++	+	+	++
Sanctions	++	+	+	+	0	+	0	+
Sampling, group and multi-site certification procedures								
Sampling options [3]	++	+	++	-	-	++	-	+
Requirements	--	0	++	0	0	+	-	0
Sample size	+	0	+	+	+	+	--	+
Chain of custody requirements and procedures								
Claims	++	++	++	++	+	+	+	++
Requirements tracing	+	+	++	-	0	0	+	+
Mass balance [4]	++	++	++	++	++	+	++	++
Procedures change ownership	+	+	+	+	0	0	--	0
Prevent uncontrolled mixing	+	+	+	+	+	+	+	--
Recognition or affiliation of system and acceptance other systems								
Level of recognition	+	-	+	+	0	0	-	0
Recognition other systems [6]	+	+	+	+	-	+	-	-

[1] Items that overlap with ISO 65 requirements are considered as covered by the system, [2] considered as partially covered, in case accreditation is possible by national government authority, [3] group sampling by FGP not considered to make this summary, (see table A.13), [5] considered as complied in case system applies continuous or fixed inventory, the use of an IT tracking system not considered for this overview table.

Figure 18: comparison of 8 sustainability certification systems (Van Dam, Ugarte et al. 2012)

There is a clear need for further harmonization of the different certification systems as already indicated in 2010 (van Dam and Junginger 2011). Certification should ideally be combined with additional measurements and tools on a regional, national and international level. Besides harmonisation of the sustainability systems, further lowering barriers for trade of biofuels could be done by reducing or abolishing import tariffs and by creating linkages to multinational trade agreements (Junginger, van Dam et al. 2011).

7 Conclusions

Trade in biofuels and biomass has increased significantly over the past 10 years and this trend is expected to continue in the future. The EU currently is the most lucrative market for solid and liquid biofuels. This is mainly due to EU policies and the emphasis on sustainability.

The main conclusions of this report are presented below:

- The RED-EU imposes targets and induces the market for biofuels in EU.
- The market for wood pellets is clearly identified. Mainly for industrial pellets, imports will be necessary. Canada and USA will continue to be large suppliers up to 2020; new players can come, but their contribution is uncertain.
- The current regulation does not impose certified production regarding sustainability, but the consumer market does. Thus, the tendency is clear.

- The market for liquid biofuels up to 2020 will be imposed by the existing regulation. How the targets will be reached by each MS is less certain.
- The scenarios are defined by possible changes of trade rules and by the priority on biodiesel or ethanol. In case of keeping trade duties, domestic production will be (more) competitive and some MS could give priority to ethanol.
- On the other hand, in case of a (more) liberalized market, imports will be more important and less ethanol could be demanded.
- In any case, in Europe the main market of liquid biofuels is for biodiesel.
- Certified production of liquid biofuels is a reality. What can be additional is the explicit consideration of socio-economic impacts.
- The production of new bio-products is a tendency but the market barely will be large in short to mid-term.
- From the production point of view, the tendency is the production in Europe, from imported raw materials. The strategy seems clear from the ongoing investments in important ports in Europe.
- In the future, the production of new bioproducts must be certified (regarding sustainability) as well. The initiatives for biofuels shall be a guideline.

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